stoneconsulting,inc

December 7, 2016

Lawrence Retirement Board
354 Merrimack Street
Suite 302
Lawrence, MA 01843

Dear Lawrence Retirement Board:

Stone Consulting, Inc. has performed a January 1, 2016 actuarial valuation of the Lawrence Retirement System. This valuation and report was prepared using generally accepted actuarial principles and practices and meets the parameters set by the Governmental Accounting Standards Board. To the best of our knowledge, this report is complete and accurate, and the assumptions used represent our best estimate of anticipated experience of the system except where noted in the text.

As part of performing the valuation, Stone Consulting, Inc. was furnished member data by the Lawrence Retirement System's administrative staff. Although examined for general reasonableness, the data was not audited by the actuary. In addition, the administrative staff furnished financial statements that were not audited by the actuary or by the plan's auditors.

The funding objective of the plan is to fully fund the system while attempting to maintain a stable contribution amount for the upcoming fiscal year that is consistent with prior funding schedules or if employer finances allow it, to increase the contribution amount. This funding objective is being met.

We anticipate over time the contribution level to increase as a percentage of payroll. The contribution rate is determined by adding the normal cost plus an amortization of the unfunded actuarial accrued liability. The normal cost is expected to remain at a level percentage of payroll. The length of the funding schedule contained in this actuarial valuation report is twenty years (fully funded by 2037). The amortization of the unfunded liability is set to increase by 3.60% each year.

The contribution amount for Fiscal Year 2018 is $20,036,714 which is $221,351 greater than the anticipated contribution amount from the prior funding schedule. PERAC and GASB guidelines indicate that actuarial valuations should be conducted every year. The Lawrence Retirement Board conducted their previous actuarial valuation effective January 1, 2014.

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Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions, changes in economic or demographic assumptions, increases or decreases expected as part of natural operation of the methodology used for these measurements such as additional contribution requirements based on the plan's funded status, and changes in plan provisions or applicable law. As part of the valuation, we have not performed an analysis of the potential range of future measurements.

We are pleased to present the results of this valuation. If the Retirement Board has any questions on the content of this report, we would be glad to respond. Please note that this report is meant to be used in its entirety. Use of excerpts of this report may result in inaccurate or misleading understanding of the results.

I, Lawrence Stone, am a consultant for Stone Consulting, Inc. I am a member of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,
STONE CONSULTING, INC.
Actuaries for the Plan

Lawrence B. Stone
Member, American Academy of Actuaries

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Introduction

This report presents the results of the actuarial valuation of the Lawrence Retirement System. The valuation was performed at the request of the Retirement Board as of January 1, 2016 for the purpose of determining the contribution requirements for Fiscal Year 2018 and beyond. The contribution requirements are based on:

- The financial condition of the system as of December 31, 2015
- The benefit provisions of M.G.L. Chapter 32 and related statutes;
- The demographics of members in the system (i.e., active and inactive participants, retirees and beneficiaries as of January 1, 2016);
- Economic assumptions regarding salary increases and investment earnings; and
- Other actuarial assumptions (e.g., withdrawals, retirement, death, etc.)

Valuation Summary

	January 1, 2016 Valuation	January 1, 2014 Valuation	Change
Contribution Fiscal 2018	$20,036,714	$19,815,363	$221,351 increase
Funding Schedule Length (as of Fiscal 2018)	20 years	21 years	1 year decrease
Amortization Increase	3.60%	3.42%	0.18%
Funding Ratio	46%	45%	1%
Interest Rate Assumption	7.75%	7.75%	0.00%
Salary Increase Rate Assumption	3.75% ultimate rate, plus 4.00% steps for the first five years of service	Same select and ultimate assumption	No change

- The System, over the two-year period from January 1, 2014 to December 31, 2015, experienced a 3.9% annual return on the market value of assets versus our assumption of 7.75%. There was a $13,653,009 net actuarial asset loss in calendar years 2014 and 2015. The System's asset portfolio, effective December 31, 2015 is approximately 80% equities and 20% fixed income and short-term investments. The interest rate assumption was maintained at 7.75% to reflect anticipated future market performance.

- The investment return assumption is a long term assumption and is based on capital market expectations by asset class, historical returns, and professional judgement.

- The salary increase assumption is based on a select and ultimate table, with a 3.75% ultimate rate. Employees receive 4.00% steps for their first five years of service. This assumption has been maintained from the prior valuation. Total compensation changed by 3.3% over the prior valuation; however average annual compensation (compensation divided by number of active members) changed by -1.9%, a decrease. This is due in part to new hires in the 2014 and 2015 calendar years.

- The salary increase assumption reflects prior experience including PERAC's 2002 local experience study, current expectations, and professional judgement.

- Salaries for the 2015 calendar year were adjusted to reflect the fact that an extra pay period occurred in 2015. Employees paid on a weekly basis received 53 pay periods, and biweekly employees received 27. Salary figures for each employee were reduced by a factor depending on their pay basis.

- The funding level of the Lawrence Retirement System is 46% compared to 45% for the January 1, 2014 actuarial valuation. The funding level is estimated to be below the median for Massachusetts' Contributory Retirement Systems.

The schedule length is twenty (20) years, one year shorter than the 21 years remaining from the 21 year schedule from the January 1, 2014 valuation. The maximum period permitted under Section 22F of Chapter 32 of the Massachusetts General Laws is twenty-three years (Fiscal 2040). The amortization of the unfunded liability increases by 3.60% each year.

- Non-economic assumptions were maintained from the January 1, 2014 actuarial valuation. The mortality assumption is based upon the RP-2000 mortality table projected with generational mortality, scale BB, and a base year of 2000.

January 1, 2016 Actuarial Valuation Results

	January 1, 2016	January 1, 2014	Percentage Change
Funding			
Contribution for Fiscal 2018	$20,036,714		1.1%
Contribution for Fiscal 2018 based on current schedule		$19,815,363	
Members			
▪ Actives			
a. Number	1,600	1,519	5.3%
b. Annual Compensation	$69,995,537	$67,766,770	3.3%
c. Average Annual Compensation	$43,747	$44,613	-1.9%
d. Average Attained Age	44.0	44.6	-1.3%
e. Average Past Service	10.6	10.8	-1.9%
▪ Retired, Disabled and Beneficiaries			
a. Number	887	879	0.9%
b. Total Benefits*	$23,028,459	$21,643,207	6.4%
c. Average Benefits*	$25,962	$24,623	5.4%
d. Average Age	73.7	73.5	0.2%
▪ Inactives			
a. Number	382	309	23.6%
Normal Cost			
a. Total Normal Cost as of January 1, 2016	$8,737,363	$8,469,461	3.2%
b. Less Expected Members' Contributions	6,472,234	6,197,062	4.4%
c. Normal Cost to be funded by the Municipality	$2,265,129	$2,272,399	-0.3%
d. Adjustment to July 1, 2017	145,926	146,394	-0.3%
e. Administrative Expense Assumption	493,786	469,174	5.2%
f. Normal Cost Adjusted to July 1, 2017	$2,904,840	$2,887,967	0.6%
Actuarial Accrued Liability as of January 1, 2016			
a. Active Members	$173,821,085	$166,391,208	4.5%
b. Inactive Members	3,774,505	3,185,441	18.5%
c. Retired Members and Beneficiaries	220,436,118	209,606,312	5.2%
d. Total	$398,031,708	$379,182,961	5.0%
Unfunded Actuarial Accrued Liability			
a. Actuarial Accrued Liability as of January 1, 2016	$398,031,708	$379,182,961	5.0%
b. Less Actuarial Value of Assets as of January 1, 2016	182,660,273	168,979,467	8.1%
c. Unfunded Actuarial Accrued Liability as of January 1, 2016	$215,371,436	$210,203,493	2.5%
d. Adjustment to July 1, 2017	9,163,575	10,978,689	
e. Unfunded Actuarial Accrued Liability as of July 1, 2017	$224,535,011	$221,182,182	

*Excluding State reimbursed COLA

Data and History of Active Participants

- The data was supplied by the Lawrence Retirement Board. The data was checked under broad parameters for reasonableness. With the assistance of the staff of the Lawrence Retirement Board, we were able to develop a database sufficient for valuation purposes.

Valuation Year	Number	Average Age	Average Past Service	Average Ann'l Compensation
2016	1,600	44.0	10.6	$43,747
2014	1,519	44.6	10.8	$44,613
2012	1,313	45.9	11.9	$42,473
2010	1,368	45.2	11.4	$42,274
2008	1,503	44.6	10.4	$39,639
2007	1,517	44.3	9.9	$39,010
2004	1,569	42.4	8.1	$32,094
2003	1,734	41.9	7.4	$30,923
2000	1,672	42.4	8.4	$27,567

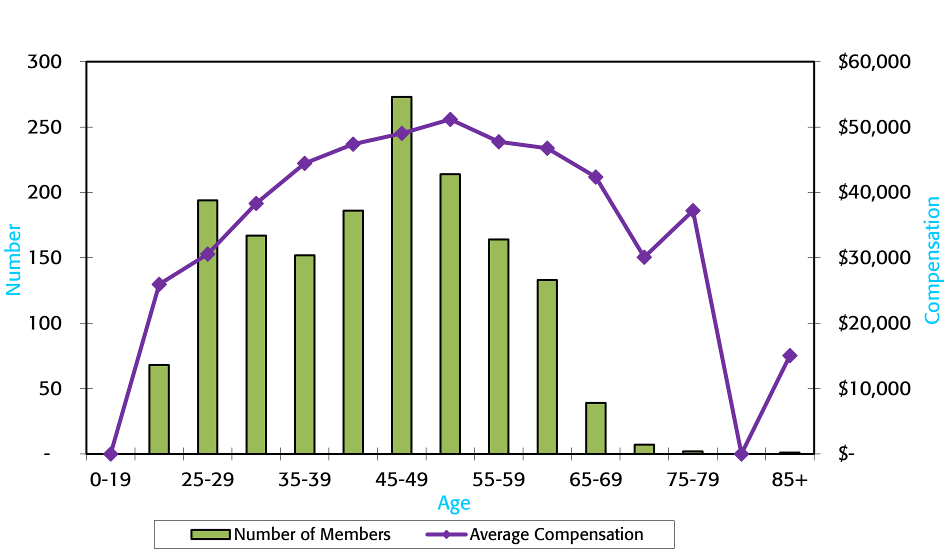
- Employee age has increased by 1.6 years and service has increased by 2.2 years over the course of the past sixteen years. This is consistent with the trend in the Commonwealth towards an aging of the employee population. However, since the 2012 valuation, the average age has decreased by 1.9 years and average service has decreased by 1.3 years. We attribute this to increased hiring particularly in the School Department. Average annual compensation has grown by 58.7% (2.9% annually) over the same time period.

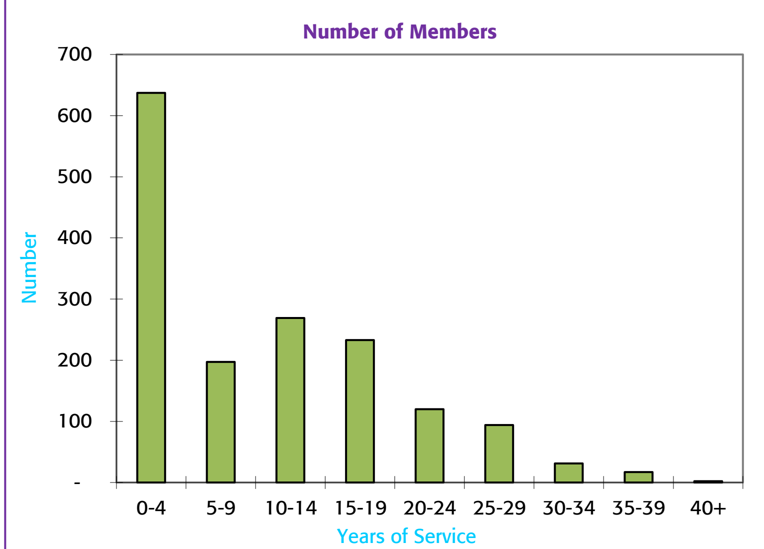
The charts on the following pages summarize demographic information regarding active and retiree members.

Distribution of Plan Members as of January 1, 2016

ACTIVE MEMBERS

AGE	0-4 Years	5-9 Years	10-14 Years	15-19 Years	20-24 Years	25-29 Years	30-34 Years	35-39 Years	40 + Years	Total	Total Compensation	Average Compensation
0-19	-	-	-	-	-	-	-	-	-	-	$ -	$ -
20-24	68	-	-	-	-	-	-	-	-	68	$ 1,764,404	$ 25,947
25-29	183	11	-	-	-	-	-	-	-	194	$ 5,929,046	$ 30,562
30-34	105	39	21	2	-	-	-	-	-	167	$ 6,395,792	$ 38,298
35-39	61	38	43	10	-	-	-	-	-	152	$ 6,754,023	$ 44,434
40-44	65	21	47	43	9	1	-	-	-	186	$ 8,814,032	$ 47,387
45-49	73	33	50	68	30	18	1	-	-	273	$ 13,386,729	$ 49,036
50-54	39	23	41	38	34	30	7	2	-	214	$ 10,952,139	$ 51,178
55-59	23	16	31	35	26	14	11	8	-	164	$ 7,830,903	$ 47,749
60-64	14	11	26	31	16	19	10	5	1	133	$ 6,216,999	$ 46,744
65-69	5	5	7	6	3	9	1	2	1	39	$ 1,651,255	$ 42,340
70-74	1	-	2	-	1	3	-	-	-	7	$ 210,733	$ 30,105
75-79	-	-	-	-	1	-	1	-	-	2	$ 74,430	$ 37,215
80-84	-	-	-	-	-	-	-	-	-	-	$ -	$ -
85+	-	-	1	-	-	-	-	-	-	1	$ 15,051	$ 15,051
TOTAL	**637**	**197**	**269**	**233**	**120**	**94**	**31**	**17**	**2**	**1,600**	**$ 69,995,537**	**$ 43,747**





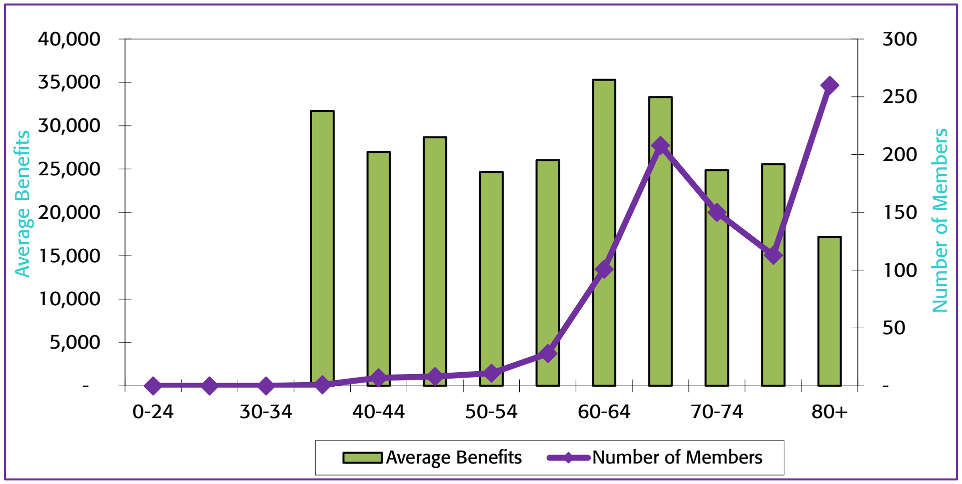
Distribution of Plan Members as of January 1, 2016

RETIRED MEMBERS

Retired Members and Beneficiaries			
Age	Number	Average Benefit	Total Benefit
0-24	-	-	-
25-29	-	-	-
30-34	-	-	-
35-39	-	-	-
40-44	1	4,277	4,277
45-49	4	29,813	119,250
50-54	6	15,675	94,052
55-59	18	18,409	331,362
60-64	84	33,611	2,823,332
65-69	176	32,134	5,655,636
70-74	124	23,663	2,934,201
75-79	101	24,875	2,512,354
80+	242	16,729	4,048,472
TOTAL	**756**	**$ 24,501**	**$ 18,522,936**

Disabled Members			
Age	Number	Average Benefit	Total Benefit
0-24	-	-	-
25-29	-	-	-
30-34	-	-	-
35-39	1	31,715	31,715
40-44	6	30,749	184,496
45-49	4	27,498	109,990
50-54	5	35,477	177,383
55-59	10	39,754	397,540
60-64	17	43,615	741,454
65-69	32	39,773	1,272,731
70-74	26	30,636	796,535
75-79	12	31,374	376,484
80+	18	23,178	417,196
TOTAL	**131**	**$ 34,393**	**$ 4,505,523**

Total			
Age	Number	Average Benefit	Total Benefit
0-24	-	-	-
25-29	-	-	-
30-34	-	-	-
35-39	1	31,715	31,715
40-44	7	26,968	188,773
45-49	8	28,655	229,241
50-54	11	24,676	271,435
55-59	28	26,032	728,901
60-64	101	35,295	3,564,786
65-69	208	33,309	6,928,367
70-74	150	24,872	3,730,737
75-79	113	25,565	2,888,838
80+	260	17,176	4,465,667
TOTAL	**887**	**$ 25,962**	**$ 23,028,459**



Benefits shown are net of State reimbursed COLA.

Valuation Methodology

Stone Consulting, Inc. used the Entry Age Normal actuarial funding method in this actuarial valuation. The use of the Entry Age Normal actuarial funding method is consistent with the requirements of Chapter 32 of the Massachusetts General Laws.

NORMAL COST

	January 1, 2016	% of Payroll*
Gross Normal Cost (GNC)	$8,737,363	12.5%
Employees Contribution	$6,472,234	9.2%
Net Normal Cost (NNC)	$2,265,129	3.2%
Adjusted to Beginning of Fiscal Year 2018	$145,926	
Administrative Expense	$493,786	0.7%
Adjusted Net Normal Cost With Admin. Expense	$2,904,840	

* Payroll paid in 2015 for employees as of January 1, 2016 is $69,995,537. Payroll for new hires in 2015 was annualized. Payroll was adjusted to eliminate the effect of additional pay periods that occurred in 2015.

- The gross normal cost (GNC) is the "price" of benefits accruing in the current year if the assumptions underlying the normal cost were realized.
- An individual normal cost represents that part of the cost of a member's future benefits that are assigned to the current year as if the costs are to remain level as a percentage of the member's pay. Benefits payable under all circumstances (i.e., retirement, death, disability, and withdrawals) are included in this calculation.
- Anticipated employee contributions to be made during the year are subtracted from the GNC to determine employer normal cost, or net normal cost (NNC).
- Administrative expenses added to the NNC. The administrative expense does not include investment manager and custodial fees. These fees are considered part of the interest rate assumption that is net of fees.

Actuarial Accrued Liability and Funded Status

				January 1, 2016	Percentage Change
Active Actuarial Accrued Liability			$	173,821,085	4.5%
Superannuation	$	157,867,868			
Death	$	3,819,922			
Disability	$	10,213,860			
Withdrawal	$	1,919,435			
Retiree, Inactive, Survivor and Beneficiary Actuarial Accrued Liability			$	224,210,623	5.4%
Retirees and Beneficiaries	$	172,276,942			
Disabled	$	48,159,176			
Inactive	$	3,774,505			
Total Actuarial Accrued Liability (AAL)			$	398,031,708	5.0%
Actuarial Value of Assets (AVA)			$	182,660,273	8.1%
Unfunded Actuarial Accrued Liability			$	215,371,436	2.5%
Funded Ratio (AVA / AAL)					
2016 (7.75% interest rate):		46%			
2014 (7.75% interest rate):		45%			

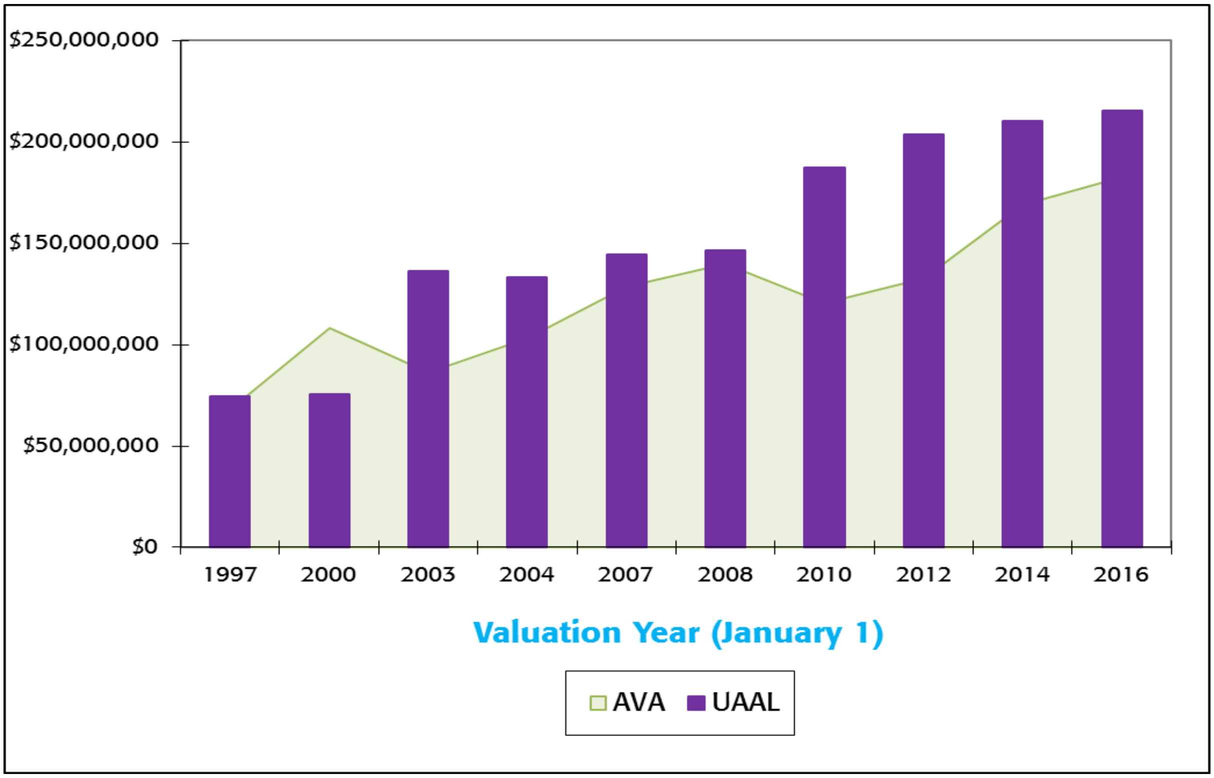
- Actuarial Accrued Liability (AAL) is the "price" of benefits attributable to benefits earned in past years, or in other words, represents today's value of all benefits earned by active and inactive members.

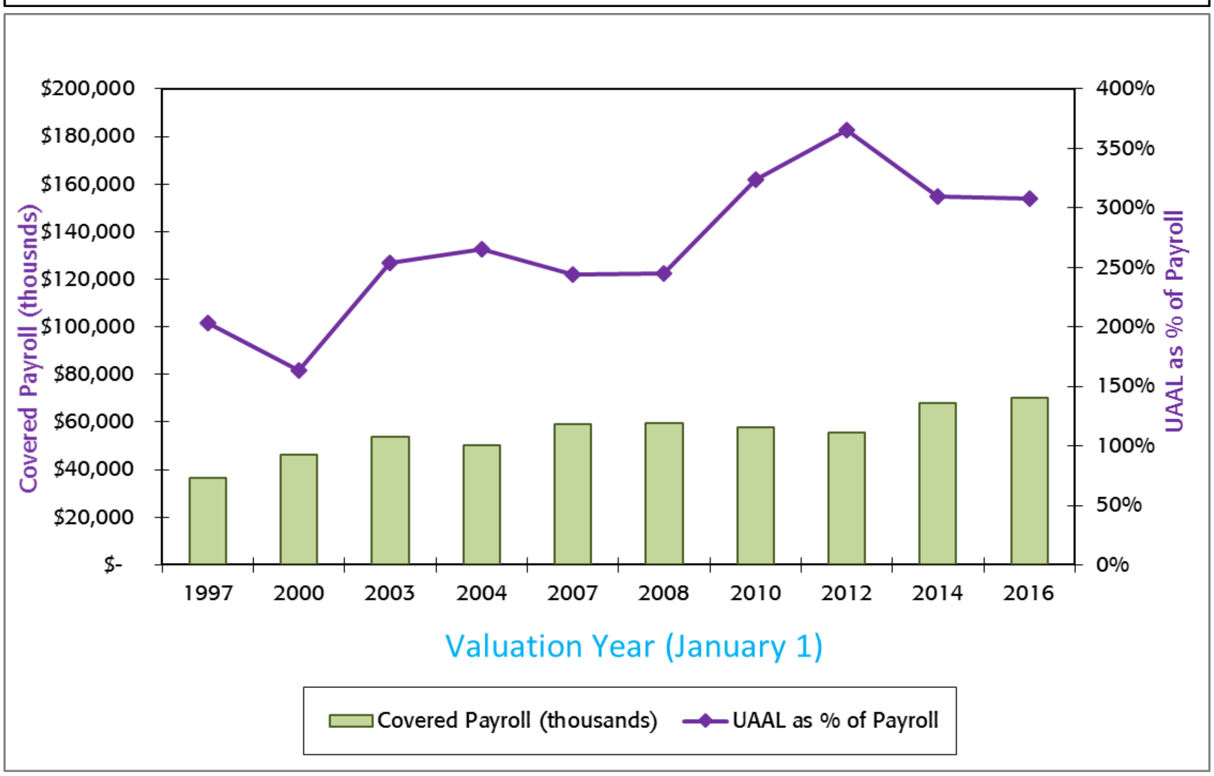
The total AAL is $398,031,708. This along with an actuarial value of assets of $182,660,273 produces a funded status of 46%. This compares to a funded status of 45% for the 2014 valuation.

The UAAL and funded ratio are measures of the plan's funded status. These measure reflect the plan's position as of January 1, 2016. We believe these measures, by themselves, are not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations or assessing the need for or the amount of future contributions. However, we believe these measures, in conjunction with the plan's funding schedule, are appropriate for assessing the amount of future contributions.

The charts on the following page contain a history of the unfunded actuarial accrued liability (UAAL), valuation assets (AVA), and covered payroll over the course of the past ten actuarial valuations.

Charts of Selected Actuarial and Demographic Statistics





Development of Funding Schedule

Net Employer Normal Cost for Fiscal 2018 (including admin. expenses)	$ 2,904,840
Net 3(8)(c) Payments	669,263
Amortization	16,214,887
Adjustment for Timing	247,724
Total Appropriation required for Fiscal 2018	$ 20,036,714

- The funding schedule is composed of the normal cost, the net 3(8)(c) payments and the amortization of the actuarial accrued unfunded liability and is adjusted by the administrative expense assumption. The contribution is assumed to be made at the beginning of the fiscal year. The 3(8)(c) payments are the amount that the Lawrence Retirement System pays to or receives from other retirement boards for service that a retiree had with a different retirement system. The net 3(8)(c) payments is the difference between what the Lawrence Retirement System paid out minus what was received by the System.

- The contribution amount for Fiscal 2018 is $20,036,714. The funding schedule is presented on page 11. The schedule's length is twenty (20) years (for the fresh start base), a one-year reduction compared to the remainder of the 23 year schedule from the January 1, 2014 valuation. The maximum funding schedule length allowed by Section 22F of Chapter 32 of the Massachusetts General Laws is twenty-three years to Fiscal 2040.

- In developing the funding schedule, we used a fresh start approach in which the unfunded actuarial accrued liability (UAAL), other than the UAAL due to past early retirement incentives, is reamortized instead of maintaining the existing amortization amount and separately amortizing the actuarial gain or loss. The use of a fresh-start approach can result in a funding schedule in which the changes in contribution amounts from year to year are more consistent. The amortization increases each year at a rate of 3.60%.

FUNDING SCHEDULE

Fiscal Year	Normal Cost	Unfunded Liability	Funding Amortization of UAAL	Net 3(8)(c) Payments	Schedule Contribution	Adjusted for August 1 Payment
2018	2,904,840	224,535,011	16,214,887	669,263	19,788,990	20,036,714
2019	3,028,296	224,464,933	16,802,389	669,263	20,499,947	20,756,572
2020	3,156,998	223,756,391	17,411,192	669,263	21,237,453	21,503,310
2021	3,291,171	222,336,952	18,042,069	669,263	22,002,502	22,277,936
2022	3,431,045	220,127,737	18,695,820	669,263	22,796,128	23,081,497
2023	3,576,865	217,042,891	19,373,276	669,263	23,619,404	23,915,078
2024	3,728,882	212,989,010	20,075,297	669,263	24,473,442	24,779,808
2025	3,887,359	207,864,525	20,802,775	669,263	25,359,397	25,676,853
2026	4,052,572	201,559,036	21,556,633	669,263	26,278,467	26,607,429
2027	4,224,806	193,952,589	22,337,828	669,263	27,231,897	27,572,794
2028	4,404,360	184,914,905	23,147,353	669,263	28,220,976	28,574,254
2029	4,591,546	174,304,538	22,545,789	669,263	27,806,597	28,154,688
2030	4,786,686	163,520,052	23,357,437	669,263	28,813,386	29,174,081
2031	4,990,121	151,025,218	24,198,305	669,263	29,857,688	30,231,456
2032	5,202,201	136,655,998	25,069,444	669,263	30,940,907	31,328,235
2033	5,423,294	120,234,513	25,971,944	669,263	32,064,501	32,465,894
2034	5,653,784	101,567,918	26,906,934	669,263	33,229,981	33,645,963
2035	5,894,070	80,447,210	27,875,583	669,263	34,438,916	34,870,033
2036	6,144,568	56,645,928	28,879,104	669,263	35,692,935	36,139,750
2037	6,405,712	29,918,752	29,918,752	669,263	36,993,727	37,456,826
2038	6,677,955	-	-	669,263	7,347,218	7,439,192

Amortization of Unfunded Liability as of July 1, 2017

Year	Type	Original Amort. Amount	Percentage Increasing	Original # of Years	Current Amort. Amount	Years Remaining
2005	ERI2002-LHA	2,746	4.50%	24	4,866	11
2005	ERI 2002-VOC	19,415	4.00%	24	32,328	11
2005	ERI2002-City	405,220	4.00%	24	674,721	11
2005	ERI2003-City	129,504	4.00%	24	215,634	11
2005	ERI2003-VOC	4,729	4.00%	24	7,874	11
2018	Fresh Start	15,279,464	3.60%	20	15,279,464	20

<u>**Notes on Amortization of Unfunded Liability**</u>

Year is the year the amortization base was established. **Type** is the reason for the creation of the base. **Original Amortization Amount** is the annual amortization amount when the base was established. **Percentage Increasing** is the percentage that the Original Amortization Amount increases per year. **Original # of Years** is the number of years over which the base is being amortized. **Current Amortization Amount** is the amortization payment amount for this year. **Years Remaining** is the number of years left to amortize the base.

Assumptions and Methodology Summary

The principal actuarial assumptions used in this valuation are the same as the assumptions used in the previous valuation, except where noted, and are summarized in the following table:

Valuation Date	January 1, 2016 Valuation
Interest Rate	7.75% (same as prior valuation).
Salary Increase	3.75% Ultimate rate, with 4.00% steps for the first five years of service.
COLA	3% of $12,000
COLA Frequency	Granted every year
Mortality	RP-2000 mortality table projected with generational mortality, scale BB, and a base year of 2000. For members retired under an Accidental Disability (job-related), 40% of deaths are assumed to be from the same cause as the disability. Disabled mortality RP-2000 mortality table projected with generational mortality, scale BB, and a base year of 2000, ages set forward 2 years. Prior valuation used the same assumption.
Overall Disability	Groups 1 and 2 50% ordinary disability 50% accidental disability Group 4 10% ordinary disability 90% accidental disability
Retirement Rates	Groups 1 and 2 Ages 55 – 70 Group 4 Ages 50 – 65
Administrative Expense	$493,786 budget estimated for FY 2018 provided by Lawrence Retirement Board.

Assets

	Cash	$	701,523.50
	PRIT Cash		500,461.64
	PRIT FUND		181,778,131.62
A	Sub-Total:	$	182,980,116.76
	Prepaid Expenses		7,665.00
	Accounts Receivable		524,507.70
	Accounts Payable		(852,016.88)
B	Sub-Total:	$	(319,844.18)
	Market Value of Assets [(A) + (B)]	$	182,660,272.58

- We were furnished with the System's annual report by the Board. The market value of assets as of December 31, 2015 (adjusted for payables and receivables) is $182,660,272.58.

- The asset allocation is approximately 20% fixed income, cash, receivables and payables and 80% equities, alternative investments, hedge funds and similar types of investments. Historically, 10% to 11% has been the expected long-term rate of return for equities, and 6% to 7% has been the expected long-term rate of return for fixed income securities. Many economists and investment professionals are projecting lower returns of 6.25% to 9.00% for equities and 3.65% to 6.00% for fixed income securities. In light of these projections, as well as historical investment returns, the 7.75% interest rate assumption is within the reasonable assumption range. We encourage close monitoring for changes in investment performance against expectations.

- Actuarial value of assets (AVA) of $182,660,273 is based on the Market Value of Assets, adjusted for payables and receivables.

Disclosure Information

SCHEDULES OF FUNDING PROGRESS
(Dollars In Thousands)

Actuarial Valuation Date	Actuarial Value of Assets A	Actuarial Accrued Liability B	Unfunded AAL (UAAL) B-A	Funded Ratio A/B	Covered Payroll C	UAAL as a % of Covered Payroll (B-A)/C
1/1/2016	$182,660	$398,032	$215,372	46%	$69,996	308%
1/1/2014	$168,979	$379,183	$210,203	45%	$67,767	310%
1/1/2012	$132,575	$336,057	$203,482	39%	$55,767	365%
1/1/2010	$120,292	$307,626	$187,334	39%	$57,831	324%
1/1/2008	$139,750	$285,983	$146,233	49%	$59,578	245%

NOTES TO SCHEDULES

Additional information as of the latest actuarial valuation follows:

Valuation Date	1/1/2016
Actuarial cost method	Entry Age Normal
Amortization method	3.60% amortization increase
Remaining amortization period	20 years for the fresh start base
Asset valuation method	Market value adjusted by accounts payable and receivables. Market value of assets is $182,660,272.58
<u>Actuarial assumptions:</u>	
Investment Rate of Return	7.75% per year
Projected Salary Increases	4.00% steps for the first five year of service <u>Ultimate Rate:</u> 3.75%

PERAC Information Disclosure

The most recent actuarial valuation of the System was prepared by Stone Consulting, Inc. as of January 1, 2016

The normal cost for employees on that date was:	$6,472,234	9.2%	of payroll
The normal cost for the employer was:	$2,265,129	3.2%	of payroll

The actuarial liability for active members was:	$173,821,085
The actuarial liability for retired members was (includes inactives):	$224,210,623
Total actuarial accrued liability:	$398,031,708
System assets as of that date ($182,660,272.58 Market Value):	$182,660,273
Unfunded actuarial accrued liability:	$215,371,436

The ratio of system's assets to total actuarial liability was:	46%

As of that date the total covered employee payroll was:	$69,995,537

The principal actuarial assumptions used in the valuation are as follows:

Investment Return:	7.75% per annum
Rate of Salary Increase:	Select and ultimate rate (3.75% ultimate rate)

SCHEDULE OF FUNDING PROGRESS (Dollars in $000's)

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded AAL (UAAL) (b-a)	Funded Ratio (a/b)	Covered Payroll (c)	UAAL as a % of Covered Payroll ((b-a)/c)
1/1/2016	$182,660	$398,032	$215,372	46%	$69,996	308%
1/1/2014	$168,979	$379,183	$210,203	45%	$67,767	310%
1/1/2012	$132,575	$336,057	$203,482	39%	$55,767	365%
1/1/2010	$120,292	$307,626	$187,334	39%	$57,831	324%
1/1/2008	$139,750	$285,983	$146,233	49%	$59,578	245%

Actuarial Methods and Assumptions

ACTUARIAL METHODS

Actuarial Cost Method

The Entry Age Normal Actuarial Cost Method has been used in this valuation. Under this method, the normal cost is the amount calculated as the level percentage of compensation necessary to fully fund the prospective benefits from each member's entry age to retirement age.

The actuarial accrued liability represents the theoretical accumulation of all prior years' normal costs for the plan members as if the program had always been in effect. The unfunded actuarial accrued liability is the excess of the actuarial accrued liability over plan assets.

Asset Valuation Method

Market value of assets (adjusted by payables and receivables).

Fiscal Year Adjustment

The actuarial results are adjusted by the valuation interest rate and salary scale to the beginning of Fiscal Year 2018. The unfunded actuarial accrued liability is rolled forward with normal cost and further adjusted by anticipated contributions and interest.

ACTUARIAL ASSUMPTIONS

Investment Return

7.75% per year net of investment expenses.

Regular Interest Rate Credited to Annuity Savings Account

2% per year.

Salary Increases

Select and Ultimate assumption – 5 years of 4.00% steps, and a 3.75% ultimate rate.

Cost-of-Living Increases

A 3% COLA on the first $12,000 of a member's retirement allowance is assumed to be granted every year.

Actuarial Methods and Assumptions
(Continued)

Withdrawal Prior to Retirement

The rates shown at the following sample ages illustrate the withdrawal assumption. Withdrawal rates are set to zero if the retirement rate at that age is nonzero.

Rate of Withdrawal

Service	Group 1 and 2	Group 4
0	15%	1.5%
1	12%	1.5%
2	10%	1.5%
3	9%	1.5%
4	8%	1.5%
5	7.6%	1.5%
10	5.4%	1.5%
15	3.3%	0.0%
20	2.0%	0.0%
25	1.0%	0.0%
30+	0.0%	0.0%

Disability Prior to Retirement

The rates shown at the following sample ages illustrate the assumption regarding the incidence of disability:

Rate of Disability

Age	Group 1 and 2	Group 4
20	0.01%	0.10%
25	0.02%	0.20%
30	0.03%	0.30%
35	0.06%	0.30%
40	0.10%	0.30%
45	0.15%	1.00%
50	0.19%	1.25%
55	0.24%	1.20%
60	0.28%	0.85%

Disability is assumed to be 50% ordinary and 50% accidental for Group 1 and 2 and 10% ordinary and 90% accidental for Group 4.

Actuarial Methods and Assumptions
(Continued)

Rates of Retirement

The rates shown at the following ages illustrate the assumption regarding the incidence of retirement, once the member has achieved 10 years of service:

Age	Group 1& 2 Male	Group 1 & 2 Female	Group 4	Hired after 4/1/2012 Group 1& 2 Male	Hired after 4/1/2012 Group 1 & 2 Female	Hired after 4/1/2012 Group 4
50	1%	1.5%	2%	0%	0%	0%
51	1%	1.5%	2%	0%	0%	0%
52	1%	2.0%	2%	0%	0%	0%
53	1%	2.5%	2%	0%	0%	0%
54	2%	2.5%	7.5%	0%	0%	0%
55	2%	5.5%	15%	0%	0%	10%
56	2.5%	6.5%	10%	0%	0%	7%
57	2.5%	6.5%	10%	0%	0%	20%
58	5%	6.5%	10%	0%	0%	10%
59	6.5%	6.5%	15%	0%	0%	15%
60	12%	5%	20%	25%	30%	20%
61	20%	13%	20%	20%	13%	20%
62	30%	15%	25%	30%	15%	25%
63	25%	12.5%	25%	25%	12.5%	25%
64	22%	18%	30%	22%	18%	30%
65	40%	15%	100%	40%	15%	100%
66	25%	20%	N/A	25%	20%	N/A
67	25%	20%	N/A	25%	20%	N/A
68	30%	25%	N/A	30%	25%	N/A
69	30%	20%	N/A	30%	20%	N/A
70	100%	100%	N/A	100%	100%	N/A

Mortality

RP-2000 mortality table projected with generational mortality, scale BB, and a base year of 2000 (sex-distinct). Prior valuation used the same assumption. During employment the healthy employee mortality table is used. Post-employment the healthy annuitant table is used. In-service death is assumed to be 55% accidental for group 1 and 2 and 90% accidental for group 4.

Disabled Life Mortality

RP-2000 mortality table projected with generational mortality, scale BB, and a base year of 2000 for healthy annuitants, set-forward by 2 years (sex-distinct). Death is assumed to be due to the same cause as the disability 40% of the time. Prior valuation used the same assumption.

Actuarial Methods and Assumptions
(Continued)

Family Composition

Members assumed married with 2 dependent children – one male and one female both age 15; age difference between member and spouse assumed to be 3 years (the male being the older).

Administrative Expenses

Estimated budgeted amount of $493,786 for the Fiscal Year 2018 excluding investment management fees and custodial fee is added to the Normal Cost.

Net 3(8)(c)

Net 3(8)(c) payments are assumed to be the same level as the past calendar year for all future years.

Step Increases

Step increases are assumed to be part of the salary increase assumption.

Credited Service

All service is assumed to be due to employment with the municipality.

Contribution Timing

Contributions are assumed to be made August 1.

Total Payroll Increase

The total payroll is assumed to increase at 4.25% per year.

Valuation Date

January 1, 2016.

Summary of Principal Provisions

1. PARTICIPANT

Participation is mandatory for all full-time employees whose employment commences before age 65. There are three classes of members in the retirement system:

- Group 1: general employees
- Group 2: employees in specified hazardous occupations (e.g., electricians)
- Group 4: police and firefighters

2. MEMBER CONTRIBUTIONS

Member contributions vary depending upon date hired as follows:

Date of Hire	Member Contribution Rate
Prior to 1975	5% of Pay
1975 – 1983	7% of Pay
1984 – June 30, 1996	8% of Pay
After June 30, 1996	9% of Pay

Members hired after 1978 contribute an additional 2% of pay over $30,000.

3. PAY

a. Pay

Gross regular compensation excluding bonuses, overtime, severance pay, unused sick pay, and other similar compensation.

b. Average Pay

The average of pay during the three consecutive years that produce the highest average or, if greater, during the last three years (whether or not consecutive) preceding retirement. For members hired after April 1, 2012, five-year averages will be used.

4. CREDITED SERVICE

Period during which an employee contributes to the retirement system plus certain periods of military service and "purchased" service.

5. SERVICE RETIREMENT

a. Eligibility

Completion of 20 years of credited service or attainment of age 55 and completion of 10 years of credited service. If hired prior to 1978 or a member of group 4, attainment of age 55.

Summary of Principal Provisions (Continued)

b. Retirement Allowance

Determined as the product of the member's benefit percentage, average pay and credited service, where the benefit percentage is shown below (maximum allowance of 80% of average pay):

Benefit Percentage	Group 1	Group 2	Group 4
2.5%	65+	60+	55+
2.4	64	59	54
2.3	63	58	53
2.2	62	57	52
2.1	61	56	51
2.0	60	55	50
1.9	59	N/A	49
1.8	58	N/A	48
1.7	57	N/A	47
1.6	56	N/A	46
1.5	55	N/A	45
	Hired after April 1, 2012*		
2.5%	67+	62+	57+
2.35	66	61	56
2.20	65	60	55
2.05	64	59	54
1.90	63	58	53
1.75	62	57	52
1.60	61	56	51
1.45	60	55	50

*Reduction is .125% for each year early instead of .15% per year for employees with over 30 years of service.

In addition, veterans receive an additional $15 per year for each year of credited service up to 20 years

6. DEFERRED VESTED RETIREMENT

a. Eligibility

Completion of 10 years of credited service (for elected and appointed members, 6 years in the event of involuntary termination).

b. Retirement Allowance

Determined in the same manner as "Service Retirement" section above with the member eligible to start collecting a benefit at age 55, (or age 57 for post-April 1, 2012 hires) or defer until later at his or her discretion. If a member chooses, his or her contributions with interest may be withdrawn. The amount of interest he or she will receive depends on length of service and whether or not the termination of employment was voluntary.

Summary of Principal Provisions (Continued)

7. ORDINARY DISABILITY RETIREMENT

a. Eligibility

Non-job related disability after completion of 10 years of credited service.

b. Retirement Allowance

Determined in the same manner as "Service Retirement" section and calculated as if the member had attained age 55 (or age 57 for those hired after April 1, 2012), if younger. Veterans receive 50% of pay (during final year) plus an annuity based on accumulated member contributions with interest.

8. ACCIDENTAL DISABILITY RETIREMENT

a. Eligibility

Disabled as a result of an accident in the performance of duties. No age or service requirement.

b. Retirement Allowance

72% of pay plus an annuity based on accumulated member contributions with interest. Also, a dependent's allowance per year for each child. Total allowance not to exceed 100% of pay (75% for members hired after 1987).

9. NON-OCCUPATIONAL DEATH

a. Eligibility

Dies while in active service, but not due to occupational injury. 2 years of service.

b. Retirement Allowance

Benefit as if Option C had been elected (see below) and member had attained age 55 (or age 57 for those hired after April 1, 2012) if younger. Minimum monthly benefits provided as follows: spouse - $500, first child - $120, each additional child - $90

10. OCCUPATIONAL DEATH

a. Eligibility

Dies as a result of an occupational injury.

b. Benefit Amount

72% of pay plus refund of annuity savings fund balance. In the case of an accidental disability retiree who dies of the same cause, the beneficiary receives 72% of the last 12 months salary or the current pension amount, whichever is greater.

Summary of Principal Provisions
(Continued)

11. COST-OF-LIVING INCREASES

An increase of up to 3% applied to the first $12,000 of annual benefit. Funded by the Municipality from Fiscal Year 1999. Percentage increase is voted on each year by the Retirement Board. Cost-of-living increases granted during Fiscal Year 1982 through Fiscal 1998 are reimbursed by the Commonwealth.

12. OPTIONAL FORMS OF PAYMENT

- Option A

Allowance payable monthly for the life of the member.

- Option B

Allowance payable monthly for the life of the member with a guarantee of remaining member contributions with interest.

- Option C

Allowance payable monthly for the life of the member with 66-2/3% continuing to the member's beneficiary upon the member's death. If the beneficiary predeceases the member, the allowance amount "pops up" to the non-reduced amount.

Glossary of Terms

- Actuarial Accrued Liability

  The portion of the Present Value of Benefits that is attributable to past service.

- Actuarial Assets

  Market value of assets (adjusted by payables and receivables).

- Actuarial Assumptions

  Estimates are made as to the occurrence of certain events that determine the level of benefits to be paid and how long they will be provided. The more important actuarial assumptions include the investment return on assets, salary increases and the rates of turnover, disability, retirement and mortality.

- Actuarial Cost Method

  The procedure that is used to allocate the present value of benefits between the liability that is attributable to past service (Actuarial Accrued Liability) and that attributable to future service.

- GASB

  Government Accounting Standards Board (issues guidance for disclosure of retirement system liabilities).

- Normal Cost

  The portion of the Present Value of Benefits that is attributable to benefits to be earned in the coming year.

- PERAC

  Public Employee Retirement Administration Commission, a division of the State government which has regulatory authority over the administration of the retirement system.

- Present Value of Benefits

  Represents the dollar value today of all benefits expected to be earned by current members if all actuarial assumptions are exactly realized.

- PRIT

  Pension Reserves Investment Trust Fund is the state controlled and administered fund for the investment of assets for members of the retirement system.

- Unfunded Actuarial Accrued Liability

  That portion of the Actuarial Accrued Liability not covered by System Assets.